

U.S. Patent Application Serial No. 10/511,442
Amendment filed December 21, 2005
Reply to OA dated June 21, 2005

AMENDMENTS TO THE CLAIMS:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

Claim 1 (Currently Amended): A process for producing a synthetic resin foam comprising the step of reacting at least one polyol with at least one polyisocyanate compound in the presence of an organic blowing agent and a catalyst,

wherein the blowing agent being is a mixture comprising 1,1,1,3,3-pentafluorobutane and at least one low-boiling halogen-containing compound,

wherein the organic blowing agent and the polyol mixture forms a premix which is substantially nonflammable;

wherein the at least one low-boiling halogen-containing compound has a relatively low thermal conductivity and a boiling point of about -90 to about 10°C and the thermal conductivity of the halogen containing compounds in the gaseous state is about 8 to about 30 mW/mK at about 1 atmospheric pressure; and

wherein the organic blowing agent further comprises at least one member selected from the group consisting of glycol compounds and amine compounds.

Claim 2 (Canceled)

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Claim 3 (Currently Amended): The ~~A~~ process according to Claim 1, wherein the organic blowing agent ~~further~~ comprises at least one glycol compound.

Claim 4 (Canceled)

Claim 5 (Currently Amended): The ~~A~~ process according to Claim 1 ~~or 2~~, wherein the halogen-containing compound has a boiling point lower than the boiling point of HFC-365mfc (40°C).

Claim 6 (Currently Amended): The ~~A~~ process according to Claim 1 ~~or 2~~, wherein the halogen-containing compound is nonflammable and has a boiling point of about 10 to about 60°C and a thermal conductivity when it is in the gaseous state of about 8 to about 20 mW/mK at about 1 atmospheric pressure.

Claim 7 (Canceled)

Claim 8 (Currently Amended): The ~~A~~ process according to Claim 1 ~~or 2~~, wherein the halogen-containing compound is at least one member selected from the group consisting of saturated or unsaturated hydrofluoroethers (HFEs), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and fluoroiodocarbons (FICs).

Claim 9 (Currently Amended): The A process according to Claim 1 ~~or~~ 2, wherein the halogen-containing compound is at least one member selected from the group consisting of 1,2-trifluoroethylene trifluoromethyl ether ($\text{CF}_2=\text{CFOCF}_3$), 1,2,2-trifluoroethylene 1,1,2,2,3,3,3-heptafluoropropyl ether ($\text{CF}_2=\text{CFOCF}_2\text{CF}_2\text{CF}_3$), perfluoropropyl epoxide ($\text{CF}_3\text{CF}(\text{O})\text{CF}_2$), perfluoro-1-butene ($\text{CF}_2=\text{CFCF}_2\text{CF}_3$), perfluorohexenes (C_6F_{12}), perfluorononenes (C_9F_{18}), perfluorohexane (C_6F_{14}), perfluorocyclobutane (*c*- C_4F_8), iodotrifluoromethyl (CF_3I), 1,1,1,2,3,3-hexafluoropropane ($\text{CF}_3\text{CFHCF}_2\text{H}$), 1,1,1,3,3,3-hexafluoropropane ($\text{CF}_3\text{CH}_2\text{CF}_3$), 1,1,1,2,3,3,3-heptafluoropropane ($\text{CF}_3\text{CFHCF}_3$), pentafluoroethane ($\text{CF}_3\text{CF}_2\text{H}$), tetrafluoroethanes (CHF_2CHF_2 , CF_3CFH_2), trifluoromethane (CF_3H), 1,1,2,2,3,3,4,4-octafluorobutane ($\text{CF}_2\text{HCF}_2\text{CF}_2\text{CF}_2\text{H}$), 1,1,1,2,2,3,4,5,5,5-decafluoropentane ($\text{CF}_3\text{CF}_2\text{CFHCFHCF}_3$), 2-trifluoromethyl-1,1,1,2,3,4,5,5,5-nonafluoropentane ($\text{C}_6\text{F}_{12}\text{H}_2$), 3,3,4,4,5,5,6,6-nonafluoro-1-hexene ($\text{F}(\text{CF}_2)_4\text{CH}=\text{CH}_2$), 2,3,3,4,4,5,5-heptafluoro-1-pentene ($\text{CH}_2\text{CFCF}_2\text{CF}_2\text{CF}_2\text{H}$), trifluoroethylene (CF_2CFH), 1,1,2,2-tetrafluoroethyl difluoromethyl ether ($\text{CF}_2\text{HCF}_2\text{OCHF}_2$), 1,1,2,2-tetrafluoroethyl methyl ether ($\text{CF}_2\text{HCF}_2\text{OCH}_3$), 2,2,2-trifluoroethyl 1,1,2,2-tetrafluoroethyl ether ($\text{CF}_3\text{CH}_2\text{OCF}_2\text{CF}_2\text{H}$), 1,1,2,3,3,3-pentafluoropropyl methyl ether ($\text{CF}_3\text{CFHCF}_2\text{OCH}_3$), nonafluorobutyl methyl ether ($\text{C}_4\text{F}_9\text{OCH}_3$), 1-trifluoromethyl-1,2,2,2-tetrafluoroethyl methyl ether ($(\text{CF}_3)_2\text{CFOCH}_3$), perfluoropropyl methyl ether ($\text{CF}_3\text{CF}_2\text{CF}_2\text{OCH}_3$), 2,2,3,3,3-pentafluoropropyl difluoromethyl ether ($\text{CF}_3\text{CF}_2\text{CH}_2\text{OCHF}_2$), 1,2,3,3,4,4-hexafluorocyclobutane (*c*- $\text{C}_4\text{F}_6\text{H}_2$), 2,3-dichlorooctafluorobutane ($\text{CF}_3\text{CFCICFCICF}_3$, boiling point: 63°C), 1-chloro-1,1,2,2,3,3,4,4-octafluorobutane ($\text{CF}_2\text{ClCF}_2\text{CF}_2\text{CF}_2\text{H}$, boiling point: 50°C), 1,2-dichlorohexafluorocyclobutane (*c*- $\text{C}_4\text{F}_6\text{H}_2$, boiling point: 60°C), and 1,1,1,3,3,3-

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hexafluoropropan-2-ol ($\text{CF}_3\text{CH}(\text{OH})\text{CF}_3$, boiling point: 59°C).

Claim 10 (Currently Amended): The A process according to Claim 1 or 2, wherein the halogen-containing compound is 1,1,1,2,3,3,3-heptafluoropropane (HFC227ea: $\text{CF}_3\text{CFHCF}_3$).

Claim 11 (Currently Amended): The A process according to Claim 1 or 2, wherein the proportion of halogen-containing compound is about 1 to about 49 mol per 100 mol of HFC-365mfc and halogen-containing compound in total.

Claim 12 (Currently Amended): The A process according to Claim 1 or 2, wherein the catalyst is a tertiary amine, an organometallic compound, or a mixture thereof.

Claim 13 (Currently Amended): An organic blowing agent for producing a synthetic resin foam, the organic blowing agent comprising 1,1,1,3,3-pentafluorobutane and at least one halogen-containing compound, the blowing agent being a mixture comprising 1,1,1,3,3-pentafluorobutane and at least one low-boiling halogen-containing compound.

wherein the organic blowing agent and the polyol mixture forms a premix which is substantially nonflammable;

wherein the at least one low-boiling halogen-containing compound has a relatively low thermal conductivity and a boiling point of about -90 to about 10°C and the thermal conductivity of

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the halogen containing compounds in the gaseous state is about 8 to about 30 mW/mK at about 1 atmospheric pressure; and

wherein the organic blowing agent further comprises at least one member selected from the group consisting of glycol compounds and amine compounds.

Claim 14 (Canceled)

Claim 15 (Currently Amended): The A blowing agent according to Claim 13 further comprising at least one glycol compound.

Claim 16 (Currently Amended): The A blowing agent according to Claim 13, wherein the halogen-containing compound is 1,1,1,2,3,3,3-heptafluoropropane (HFC227ea: CF₃CFHCF₃).

Claim 17 (Currently Amended): A premix for producing a synthetic resin foam, the premix comprising 1,1,1,3,3-pentafluorobutane, at least one halogen-containing compound and at least one polyol, the blowing agent being a mixture comprising 1,1,1,3,3-pentafluorobutane and at least one low-boiling halogen-containing compound,

wherein the premix is substantially nonflammable;

wherein the at least one low-boiling halogen-containing compound has a relatively low thermal conductivity and a boiling point of about -90 to about 10°C and the thermal conductivity of

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the halogen containing compounds in the gaseous state is about 8 to about 30 mW/mK at about 1 atmospheric pressure; and

wherein the organic blowing agent further comprises at least one member selected from the group consisting of glycol compounds and amine compounds.

Claim 18 (Canceled)

Claim 19 (Currently Amended): The A premix according to Claim 17 ~~further~~ comprising at least one glycol compound.

Claim 20 (Currently Amended): The A premix according to Claim 17, wherein the halogen-containing compound is 1,1,1,2,3,3,3-heptafluoropropane (HFC227ea: $\text{CF}_3\text{CFHCF}_3$).

Claim 21 (Currently Amended): The A premix according to Claim 17 ~~or 18~~ that is nonflammable.